

SPORT-SPECIFIC CONDITIONING CONSULTANTS

'Sport-Specific Conditioning is our Focus, Performance is our Goal'

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Preventing Injury on the Pitch: *An Integrated Approach to Injury Prevention*

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Written by Eric MacLean, B.HK, M.Exi.Sci., NSCA-CSCS, CSEP-CEP

When the game of soccer is analysed from both a biomechanic and a physiological demand perspective, several potential mechanisms of injury can be identified. The game routinely requires athletes to exert explosive, short duration changes of speed, direction, and acceleration, efforts that when considered over the duration of a game, or any segment of a season, places varying physiological demands on an athlete's musculoskeletal and energy systems. With respect to sport related injury, this collective physical demand has the potential to lead to either chronic or acute injury. The purpose of this article is to briefly explain some of the mechanisms of soccer related injury, and to provide a sample training program to help prevent the onset of injury.

A review of the literature concerning athletic injury reveals that the knee joint has the highest incidence rate in sport, and that knee injury is a condition highly prevalent among adolescent and young adults, particularly young women. Possibly, this is due to the linked nature of athletic movements, with the knee acting as an integral component of the kinetic chain that facilitates the transfer of speed, force, power and stability through all movement patterns. When considering that the body moves in a coordinated, 'linked' fashion, a straight forward relationship presents itself within the strength of one joint, or muscle group affecting the strength or stability of another. For example, strength deficiencies in the hip musculature can lead to excessive force accumulation in the knee, low back, hips and lumbar spine. Excessive, repetitive strain can lead to compromises in joint function, and predispose an athlete to pain, and or injury in several different limb or joint segments. Often, Sports medicine professionals encounter athletes who report a knee or another movement related problem where the functional cause of that problem is not in the site of pain.

The scope of this article is not to present a detailed review of all muscle or soft tissue origin and insertion points, or the relationships between fascial tension and muscle contraction length or any other of the integrated musculotendinous / musculoskeletal relationships, rather, to site these relationships as a primary cause of athletic, and soccer injury.

Sport training, regardless of the sport, however, and of particular importance in soccer training, must include exercise techniques that utilize this concept of linked movement. Closed kinetic chain exercises (Olympic lifts, free-weight exercise) are best suited to train the body as a linked system. It is the opinion of PTS that open kinetic chain exercises (eg. Seated hamstring curls), for the exception of select rehabilitation purposes, be avoided in any athletic training program.

It is commonly understood that the body responds or adapts to the demands placed on it. In the sport and exercise science literature, this is referred to as the SAID principle (Specific Adaptations to Imposed Demands). The integrated neuromuscular activation (muscle fibre recruitment, activation, and rate of firing) patterns elicited through closed kinetic chain exercises are reported to more closely induce muscle contraction patterns that occur during sport activities. With respect to soccer, exercises that mimic soccer related movements are lunges (in all directions), squats, and jumps. A combination of bi- and uni-lateral



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movement patterns help to train postural control through the synchronized co-contraction of multiple muscle groups. As functional control improves, an integrated training approach would apply changes of speed, direction, load, and where appropriate, stability, to stimulate greater postural demands and athletic strength, speed, and power outputs.

Training for soccer performance and injury prevention must also include the execution of these exercises at an intensity level that is specific to the demands of the athlete's season-specific training goals; muscle hypertrophy, power / speed, endurance etc, or performance demands. These varying training goals, which should be integrated through a periodized program design, can each be achieved with appropriate work to rest intervals and % of maximal voluntary contraction or repetition maximums, and where appropriate, as in energy system development, be based on positional, and competitive physiological demand profiling. For example, in the PTS article written by PTS Athletic Conditioning Consultant Ms. Stefanie Bronson '*Physiological Demands of Out Positions in Soccer*', a soccer athlete performs varying intensities of aerobic / anaerobic activity during a game. An integrated program would apply these rates to a training plan, so that the training is more specific to the demands of the athlete's game. However, generally speaking, a soccer-specific energy system development program must include a combination of sprints and submax running intervals of varying distances. The closer this training reflects the demands of a match, the better the athlete will be able to transition their training to the pitch: Specific Adaptations to Imposed Demands. Remember this, and train with this concept in mind. Always!

Of particular importance to the soccer athlete, and as the research suggests, to young female soccer players, is the relationship between quadriceps and hamstring strength. The strength relationship between the Quads and Hamstrings (Q : H ratio) is known to influence the structural control of the knee joint and its surrounding tissues. The literature suggests a Q : H ratio of 2:1 as acceptable for athletic activities, particularly when returning from knee injury. Off-season training plans should aim to increase hamstring strength relative to the quadriceps however, with in-season training attempting to maintain strength profiles. It is our opinion that the more balanced this agonist antagonist strength profile of the Quadriceps and Hamstrings, the greater the athlete is prepared to prevent injury. Coordinated and balanced strength developments are best achieved through the lunge and squat exercises and their various methods. An integrated training program must first include an athlete movement screen that assessment basic athletic movement: a walking lunge, gait, and body squat analysis are must haves in any movement screen.

Further, an integrated training program must also include recovery exercises such as a stretch program and possibly the use of traditional rehabilitation techniques such as the use of foam rollers, trigger point balls, and other methods to release or prevent the accumulation of excessive tension in a muscle or muscle system.

An integrated approach never forgets that the body adapts specifically to the demands that are placed on it. This approach must consider all aspects of an athlete's training: exercise technique biomechanics, work to rest ratios, training loads and frequency, seasonal demands, 'athletic' or 'training age', which cannot be assumed to be equal to competitive level, nutrition, previous injury, and injury prevention considerations. For more detailed assistance, contact us.

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Essential Exercises to Prevent Injury of the Pitch

The following 5 exercises and variations of them should be the foundation of any soccer training program at all points in a periodized training plan.



Body Squat



Lateral Lunge



Forward Lunge on BOSU



Stability Ball Hamstring Curl



Side Plank

More Soccer, and Soccer specific exercises can be found at the home of PTS Soccer at www.performancetrainingsystems.net/PTS_Soccer.php

Performance Training Systems is an athletic conditioning consulting firm based out of Brampton, ON, Canada. We provide athlete development, exercise nutrition, performance psychology, athletic training, and management and consulting services to clients within the greater Toronto area and around the world. We are committed to ethical sport values based training, and promote sport as a vehicle for developing healthy bodies, healthy minds, and healthy communities.

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